

## HOSPITAL-SPECIFIC RATINGS: 1999 AND ALL QUARTERS RESULTS

Two logistic regression models were run to adjust for differences in the mix of patients across hospitals for the **1999** and the **All Quarters** dataset (see *The California Report on Coronary Artery Bypass Graft Surgery 1999 Hospital Data: Technical Report* (PBGH and OSHPD, 2003). From the logistic regression model, we computed the expected in-hospital mortality rate and a 95% confidence interval around this estimate. We then compared each hospital's actual death rate to the 95% confidence interval around its expected death rate. If the actual death rate fell outside the 95% confidence interval around the expected death rate—either below or above—then the hospital was classified as performing “better than expected” or “worse than expected.” If the actual death rate fell within the 95% confidence interval around the expected death rate, the hospital was classified as performing “no different than expected.”

### 1999 Analysis Findings

For **1999**, 515 patients out of a total of 18,673 died in-hospital, reflecting an overall in-hospital death rate of 2.76% for the CCMRP participating hospitals. The 70 hospital participants received the following designations:

- **“No Different than Expected” performance**—67 hospitals
- **“Worse than Expected” performance**—three hospitals
  - Desert Regional Medical Center, Marin General Hospital, and Scripps Mercy
- **“Better than Expected” performance**—no hospital

It may seem surprising that no hospital received a performance grade of “better than expected.” One of the reasons for this is the low mortality rate associated with bypass surgery (fewer than 3 deaths for every 100 cases in 1999), along with the wide confidence intervals around the expected rate for many hospitals. When only looking at data for a single year, confidence intervals can be quite wide for hospitals with low annual volumes of CABG cases. Given that California has many hospitals with small annual case volumes, this makes it more difficult to identify statistical outliers.

### All Quarters Findings

The **All Quarters** data include a total of 1,048 in-hospital deaths out of 40,265 cases, reflecting an overall in-hospital death rate of 2.60%. This rate can be compared to a risk-adjusted death rate of 2.20% in New York State for the 1997-1999 period, and an overall national rate of 2.9% for 1999 as reported by the Society of Thoracic Surgeons for 30-day operative mortality.<sup>12</sup>

<sup>12</sup> Because some deaths occur after discharge but within 30 days, 30-day operative mortality is slightly higher than in-hospital mortality.

Given a larger number of cases for most hospitals as compared to the single year **1999** analysis, we have a greater ability to identify statistical outliers. For the **All Quarters** analysis, the 70 hospital participants received the following designations:

- **“No Different than Expected” performance**—59 hospitals
- **“Worse than Expected” performance**—six hospitals
  - Alta Bates Medical Center, Desert Regional Medical Center, Marin General Hospital, Memorial Medical Center of Modesto, Presbyterian Intercommunity Hospital, and Scripps Mercy
- **“Better than Expected” performance**—five hospitals
  - Doctor's Medical Center-San Pablo, Heart Hospital of the Desert, Scripps Memorial Hospital-La Jolla, Summit Medical Center, and Sutter Memorial Hospital

Figures 2 and 3 present the risk-adjusted results for each of the 70 CCMRP participants in the single year **1999** and the multi-year **All Quarters** analyses, respectively. The results are shown graphically, sorted alphabetically within geographic region.

## GUIDE TO INTERPRETING THE GRAPHS

The graphs display the following information about each hospital's performance:

**Average Volume:** The average annual volume of isolated CABG cases for each hospital.

**Observed death rate:** Represented by the solid dots. This is the actual death rate for the hospital. It is calculated by dividing the number of observed deaths for the hospital by the total number of cases for the hospital. For example, if the hospital had 250 isolated CABG cases, with seven actual in-hospital deaths, the observed death rate would be  $7/250 = 2.8\%$ .

**Expected death rate:** Represented by the vertical lines. The number of "expected" or predicted deaths from the risk model is divided by the total number of cases for the hospital to derive the expected death rate. If the hospital had 250 isolated CABG cases and an expected number of in-hospital deaths of 8.2, the *expected death rate* would be  $8.2/250 = 3.28\%$ . Note, the expected death rate is a measure of the average severity of illness of each hospital's isolated CABG patients; the higher the expected rate, the higher the average severity. The average death rate for the entire 1999 dataset is  $2.83\%$ <sup>13</sup>, so if a hospital's expected death rate is higher than  $2.83\%$ , the hospital's isolated CABG patients tend to be higher risk than the overall population of CABG patients in CCMRP's dataset.

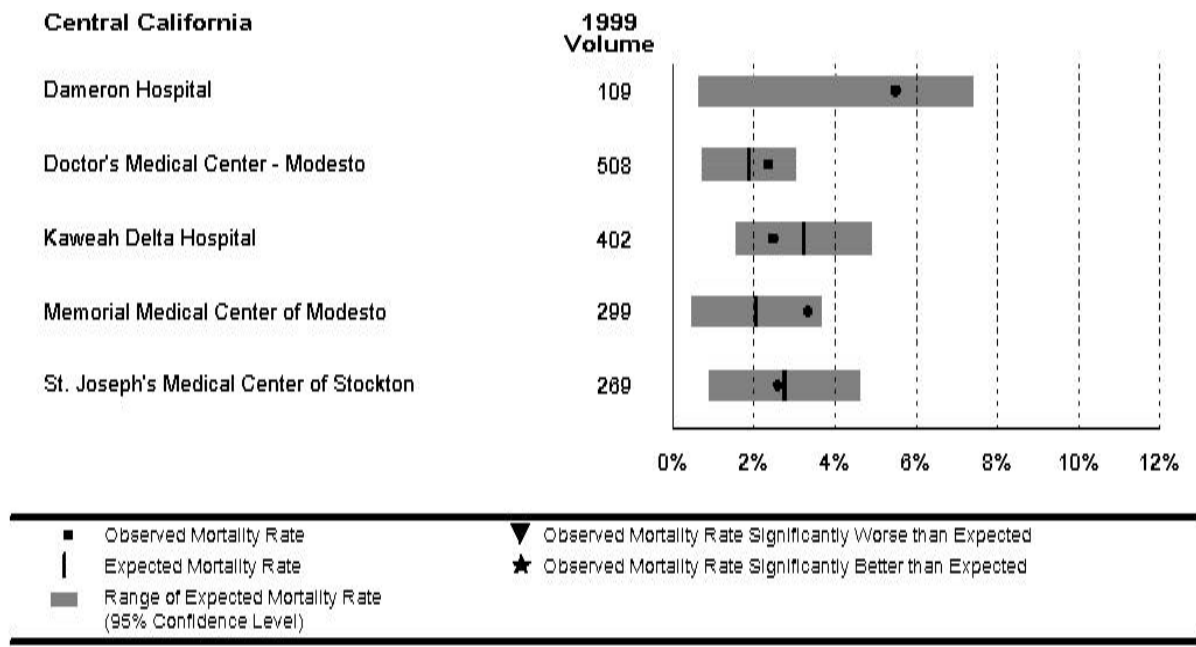
**Lower and upper confidence intervals on the expected death rate:** Represented by the bars. Confidence intervals provide a measure of the confidence regarding the estimate of the "expected" death rate. A lower confidence limit bound on the expected rate is computed by subtracting twice the standard deviation from the expected rate. Similarly, the upper bound is calculated by adding twice the standard deviation to the expected rate. Two standard deviations (2SD) below and above the expected rate is an approximate 95% confidence interval. The range that is bounded by the upper and lower intervals can be interpreted as 95 out of 100 times, the "true expected death rate" would fall within that range. Smaller intervals mean we have more confidence in our estimate. The width of the confidence interval depends both on the number of cases a hospital submitted, and the variability of the difference in the risks for the hospital's isolated CABG patients. A hospital with a larger number of cases will have a narrower confidence interval than a hospital with fewer cases.

**Overall performance rating:** The hospital's overall performance rating is based on a comparison of each facility's *observed death rate* to the 95% confidence interval around the hospital's *expected death rate*. This is a test of statistical significance.

- **Worse than expected**—the observed death rate is higher than the upper bound of the 95% confidence interval of the expected death rate.
- **Better than expected**—the observed death rate is lower than the lower bound of the 95% confidence interval of the expected death rate.
- **No different than expected**—the observed death rate falls within the 95% confidence interval of the expected death rate.

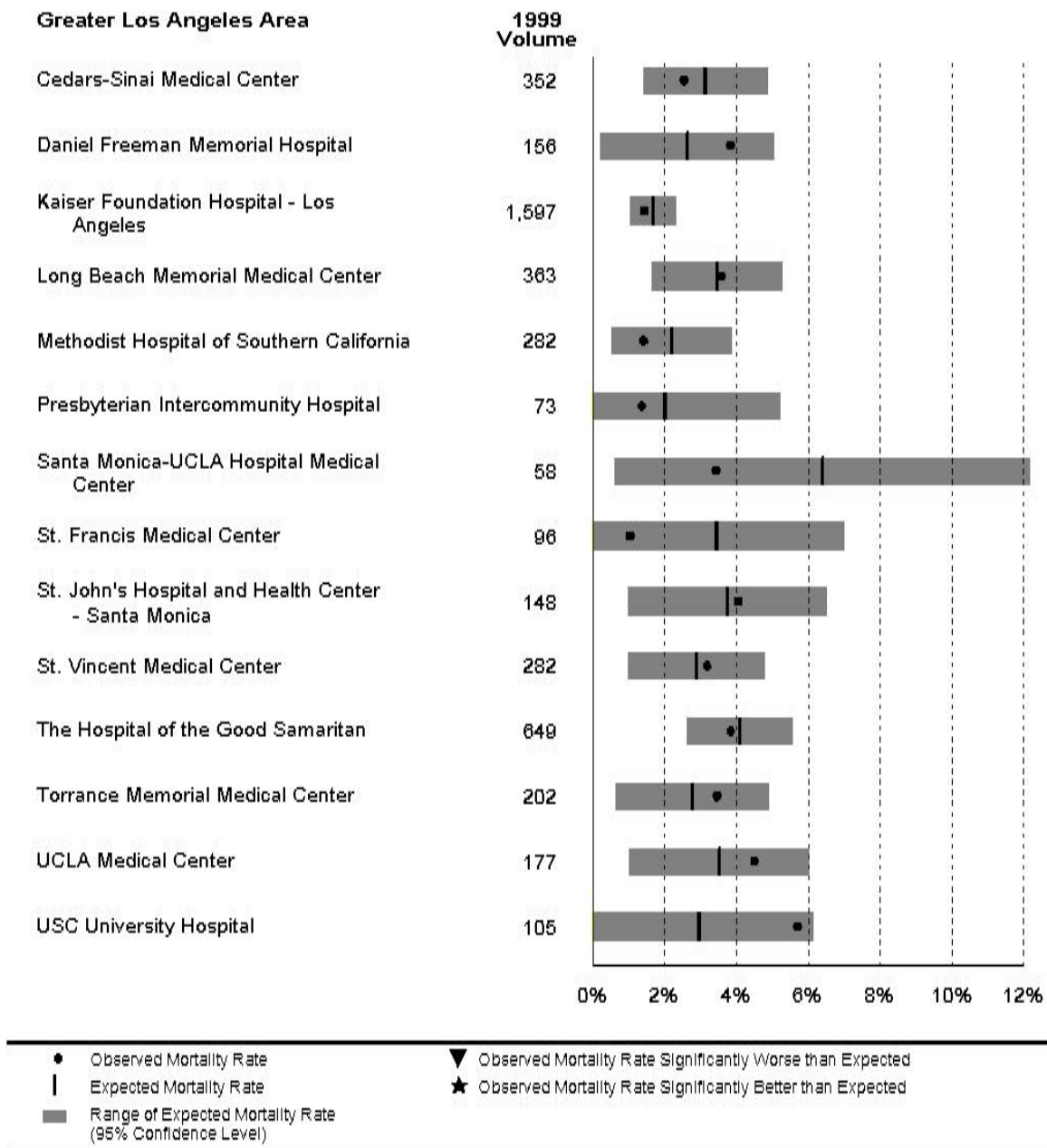
<sup>13</sup> The 1999 risk model is based on data from 81 hospitals that submitted data to CCMRP for 1999; although only 70 hospitals ultimately agreed to public reporting. The death rate of  $2.83\%$  is that for the complete set of data included in the 1999 risk model—21,973 cases from the 81 hospitals that submitted data.

**Figure 2: Comparison of Observed to Expected Mortality Rate, 1999**  
(in Alphabetical Order by Geographical Region)



**NOTE: The following hospitals in this region declined to participate:**  
 Bakersfield Memorial Hospital, Fresno Community Hospital and Medical Center,  
 Marian Medical Center, San Joaquin Community Hospital, St. Agnes Medical Center.

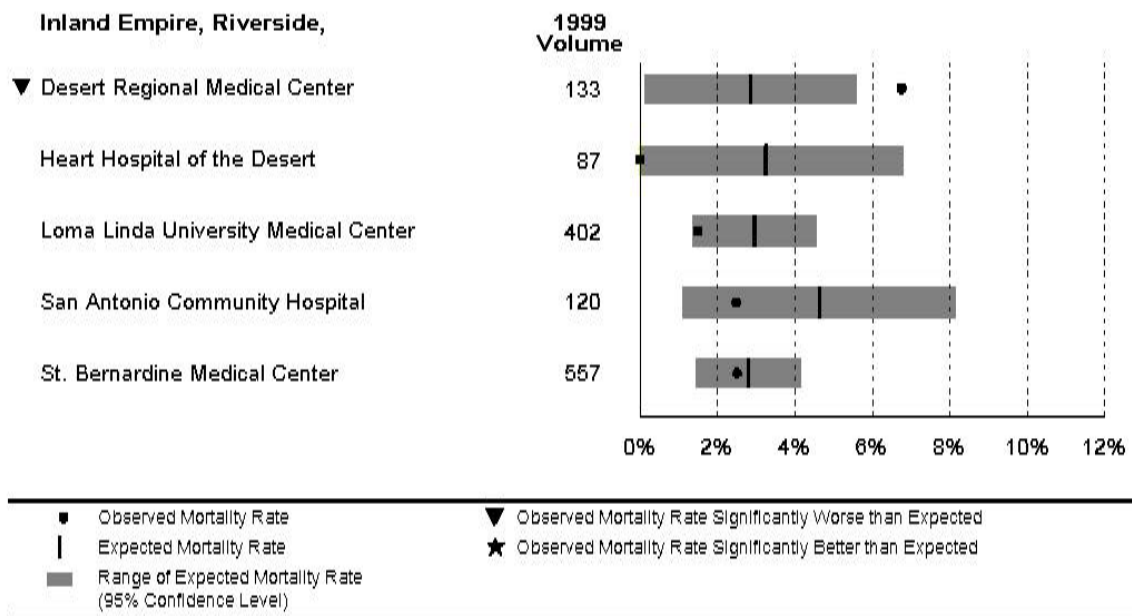
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 (cont.) (in Alphabetical Order by Geographical Region)



**NOTE: The following hospitals in this region declined to participate:**

Beverly Hospital, Brotman Medical Center, Centinela Hospital Medical Center, Downey Community Hospital, Garfield Medical Center, Huntington Memorial Hospital, Intercommunity/Citrus Valley Medical Center, LA County, Harbor-UCLA Medical Center, LA County/USC Medical Center, Lakewood Regional Medical Center, Little Company of Mary, St. Mary's Medical Center - Long Beach, White Memorial Medical Center.

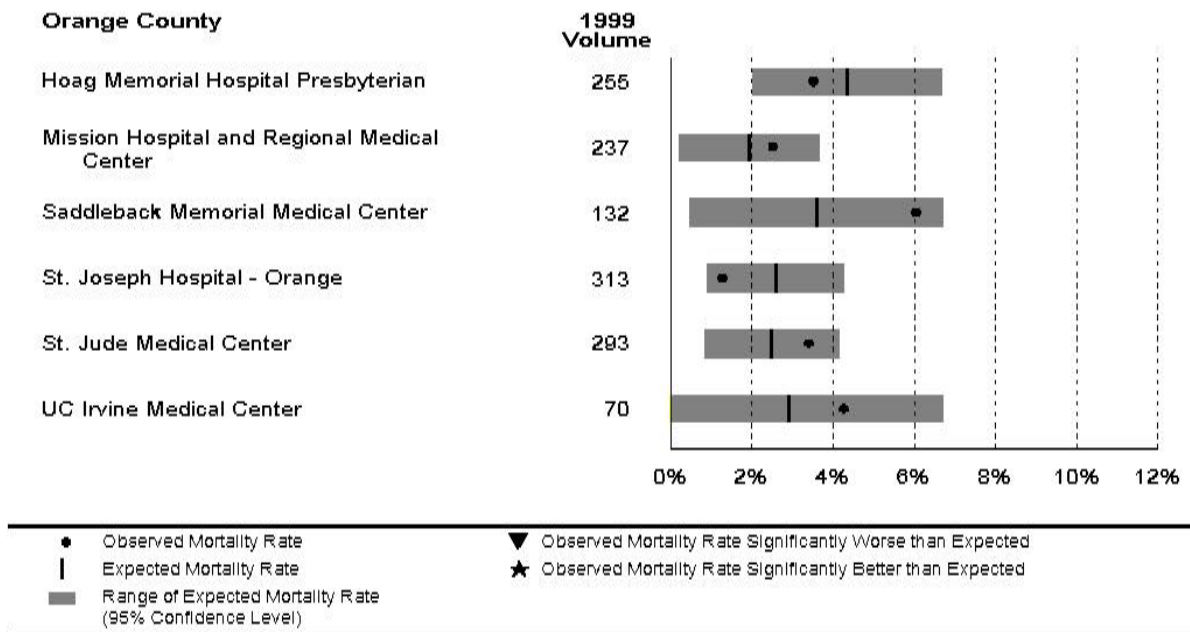
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Eisenhower Medical Center, Pomona Valley Hospital and Medical Center,  
Riverside Community Medical Center, St. Mary's Regional Medical Center.

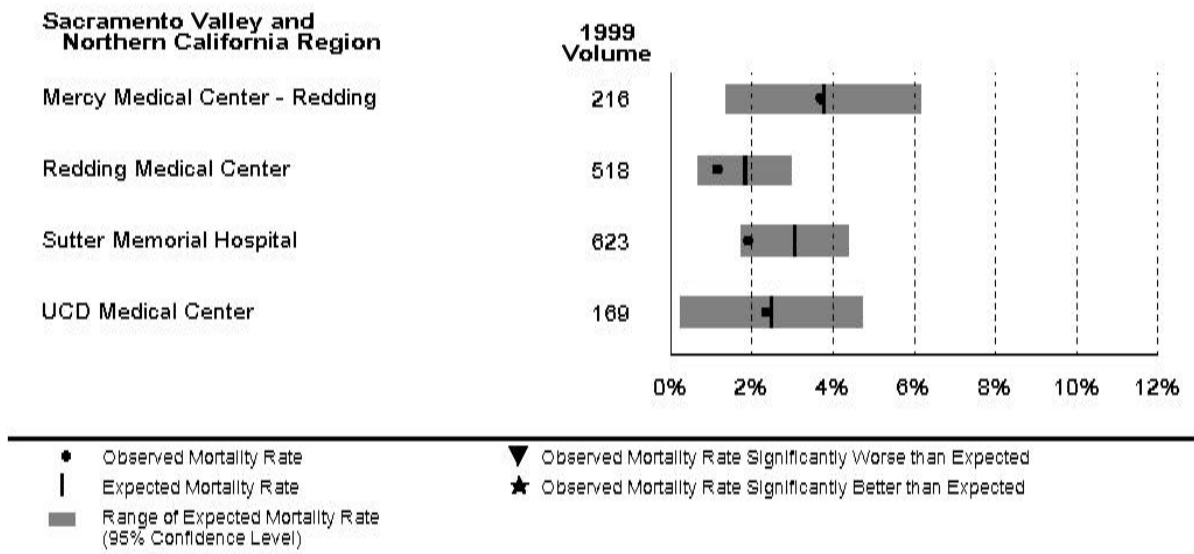
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**NOTE: The following hospitals in this region declined to participate:**

Anaheim Memorial Medical Center, Fountain Valley Regional Hospital,  
 West Anaheim Medical Center, Western Medical Center - Anaheim,  
 Western Medical Center - Santa Ana.

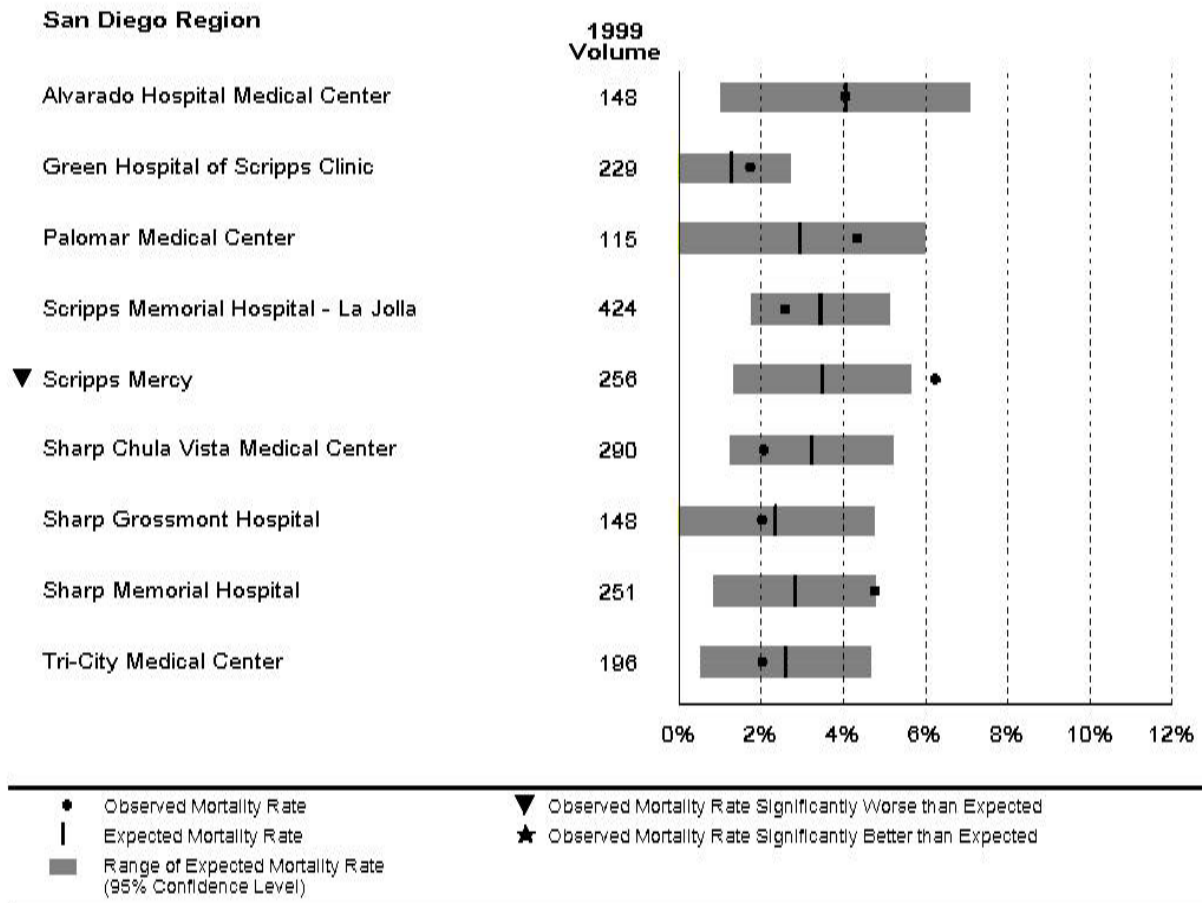
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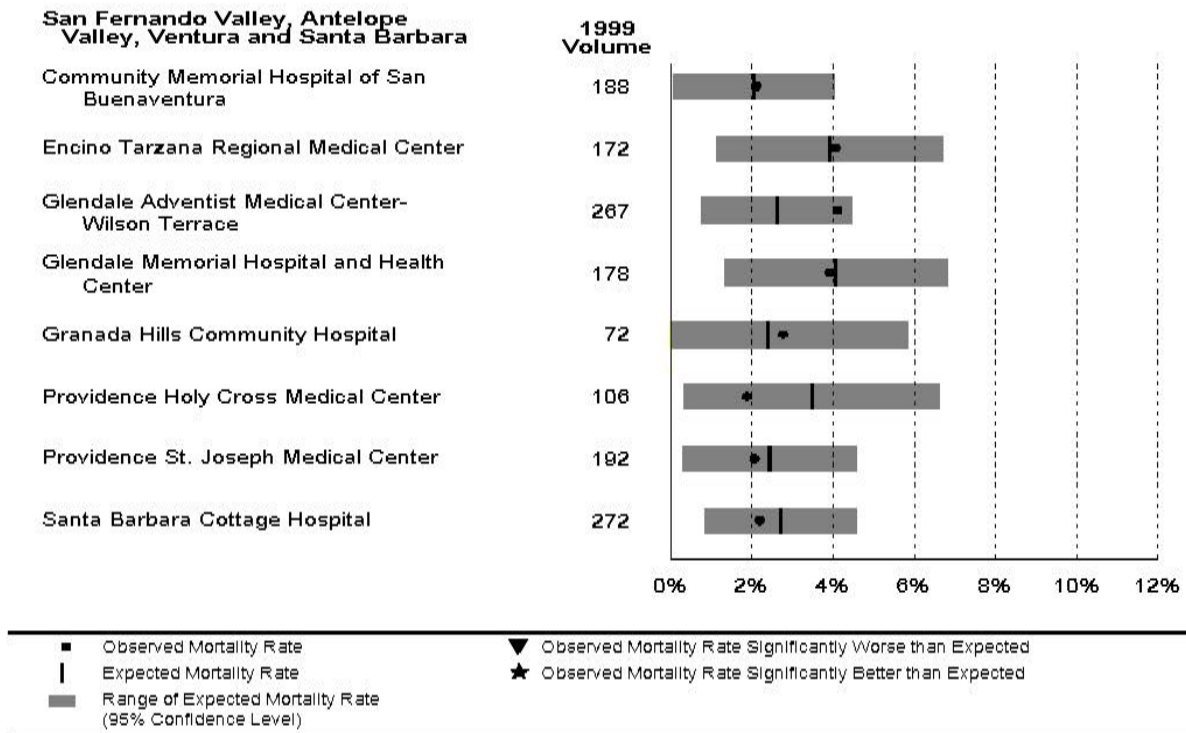


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UCSD Medical Center - Hillcrest, UCSD Medical Center - Thornton.

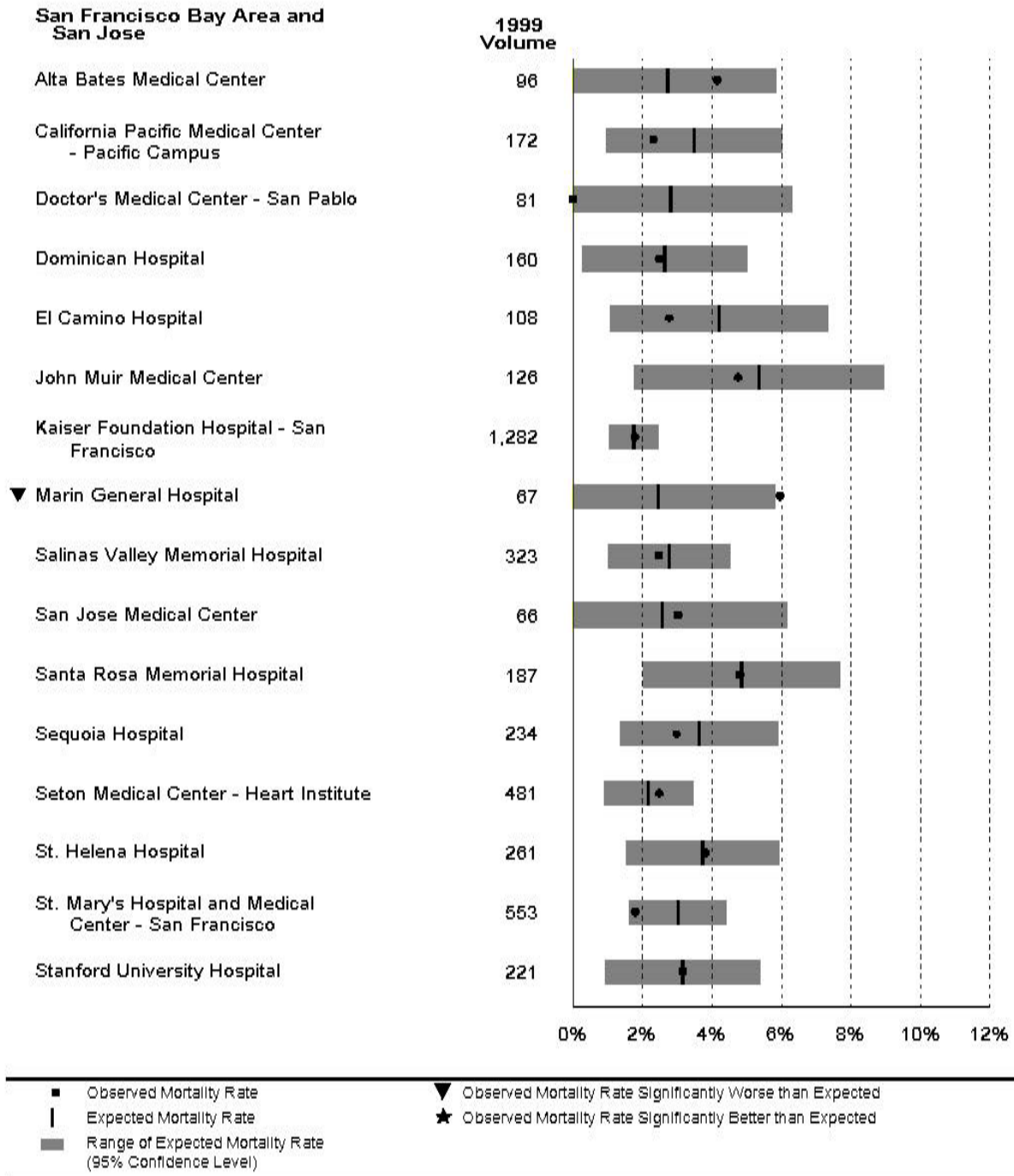
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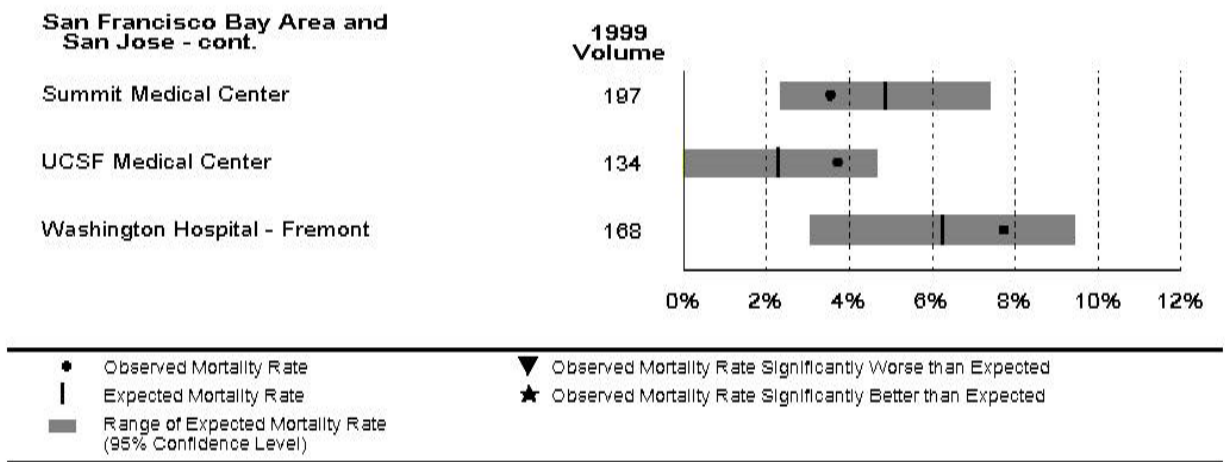
Antelope Valley Hospital Medical Center, French Hospital - San Luis Obispo, Lancaster Community Hospital, Los Robles Regional Medical Center, Northridge Hospital Medical Center, St. John's Regional Medical Center - Oxnard, Valley Presbyterian Hospital, West Hills Regional Medical Center.

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 Queen of the Valley Hospital, Santa Clara Valley Medical Center,  
 Mills-Peninsula Hospital.

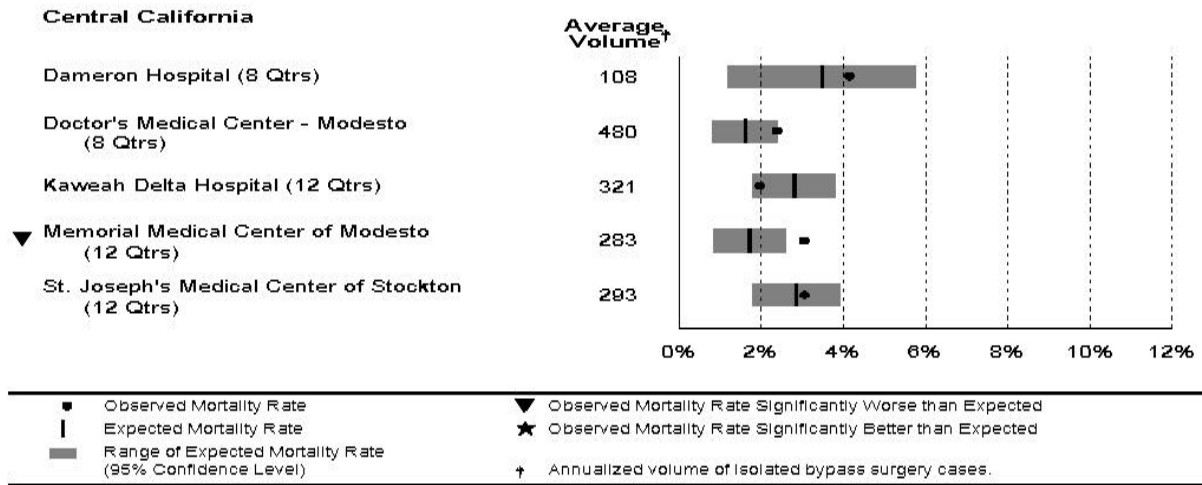
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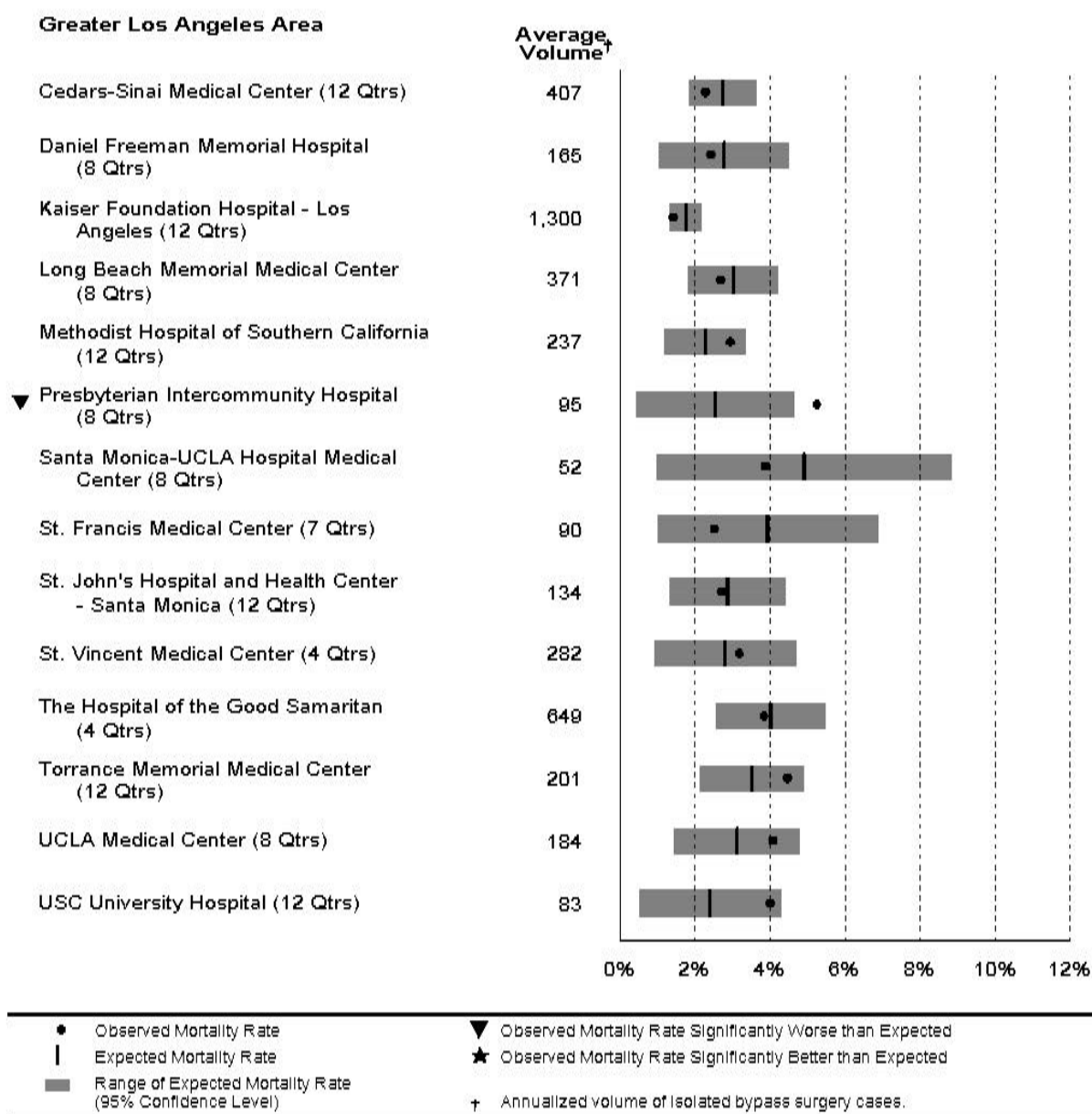


**Figure 3: Comparison of Observed to Expected Mortality Rate, 1997-1999**  
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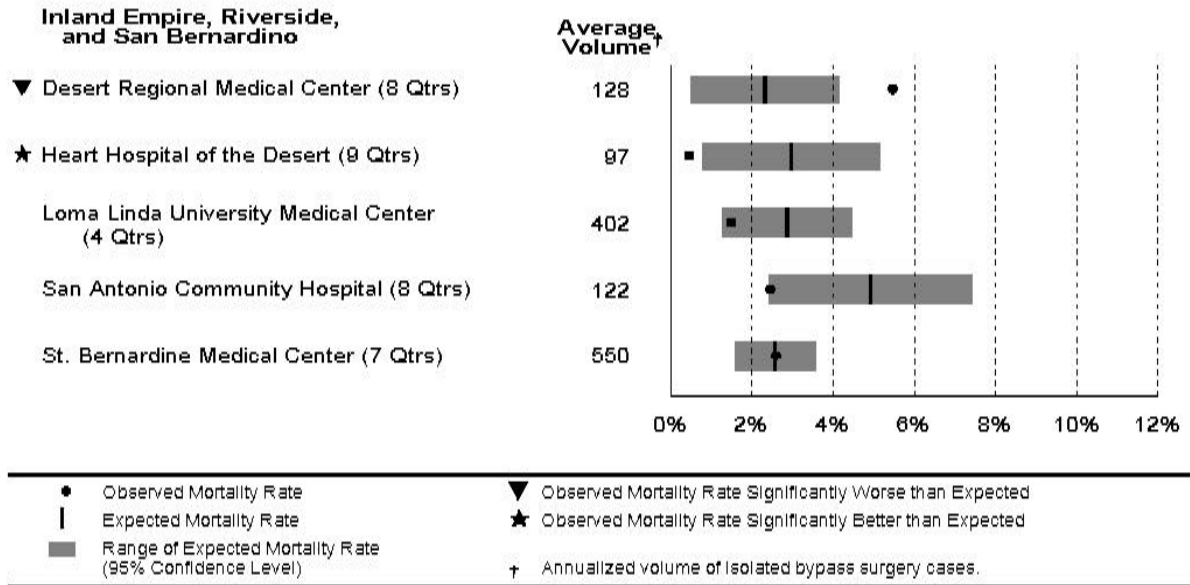
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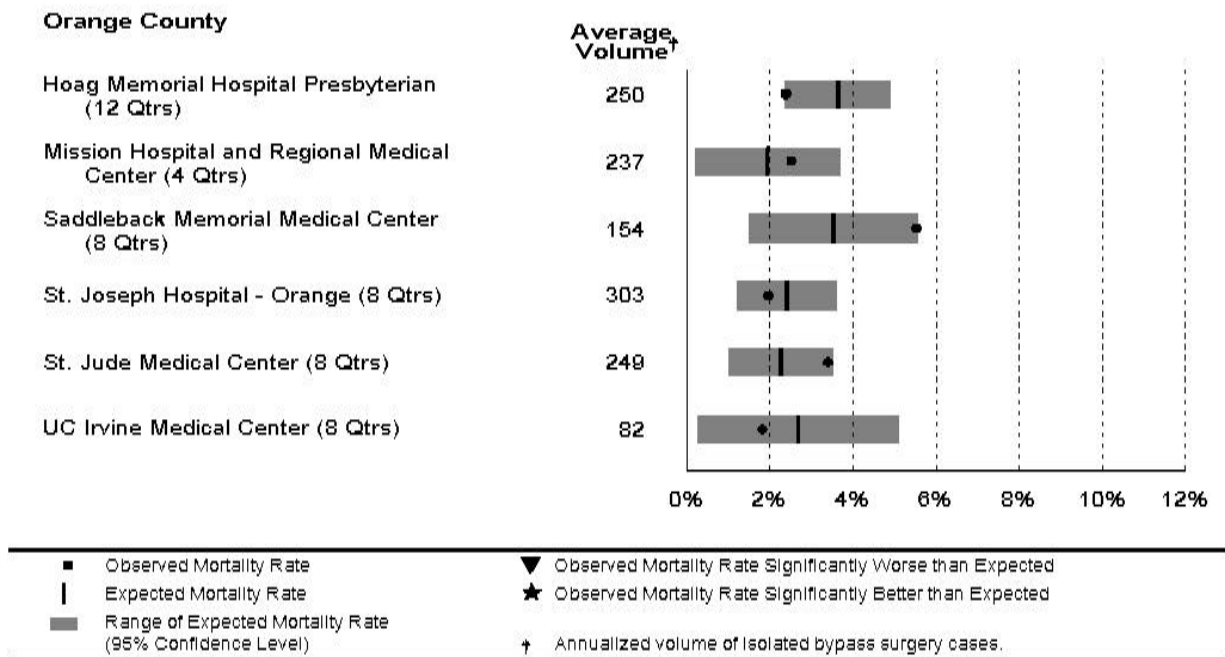
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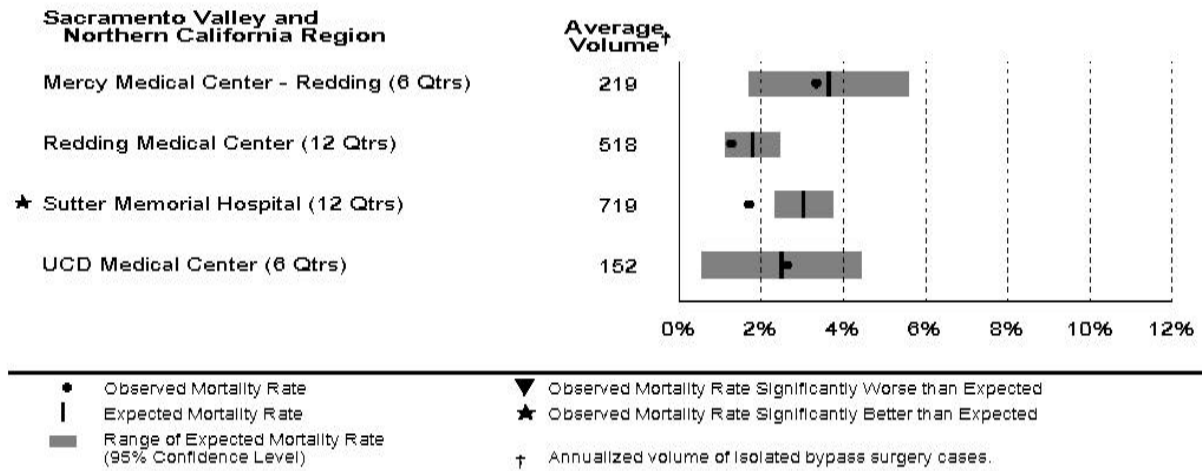
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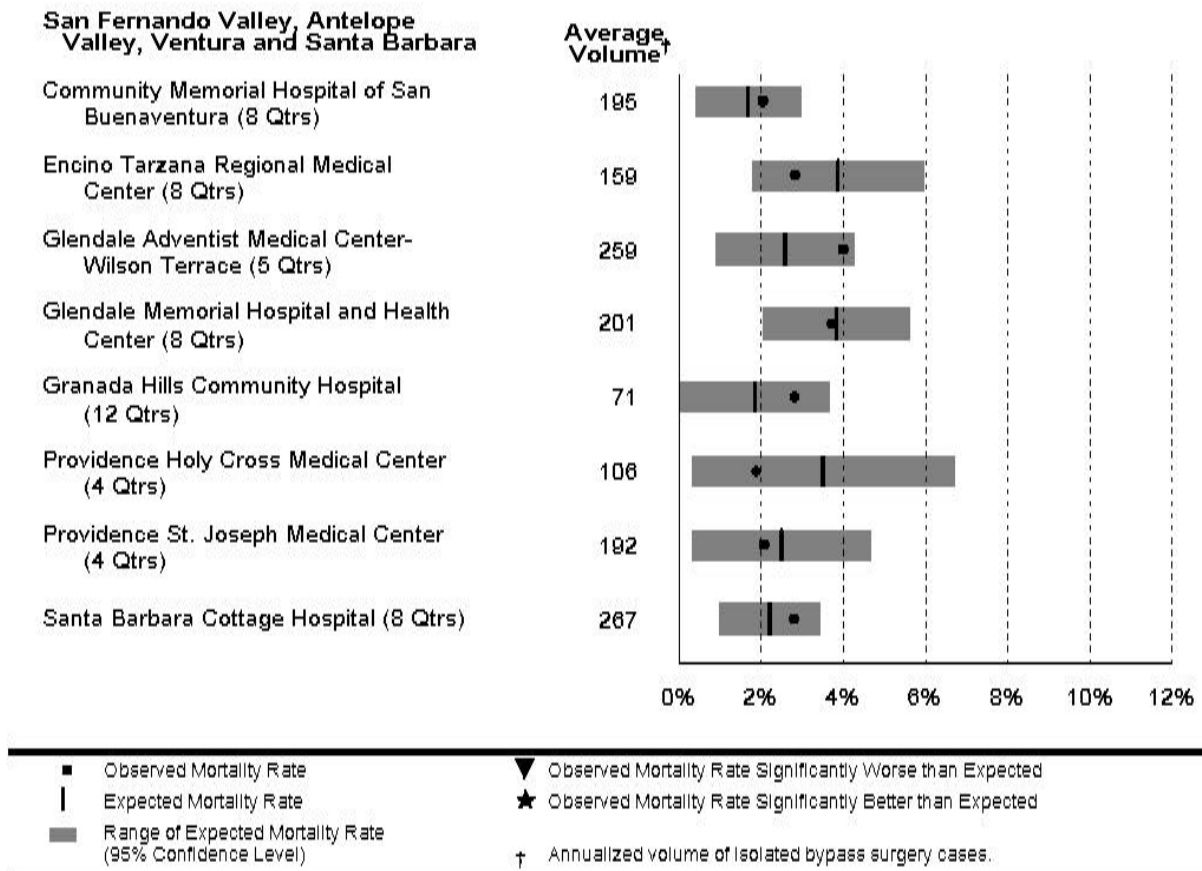
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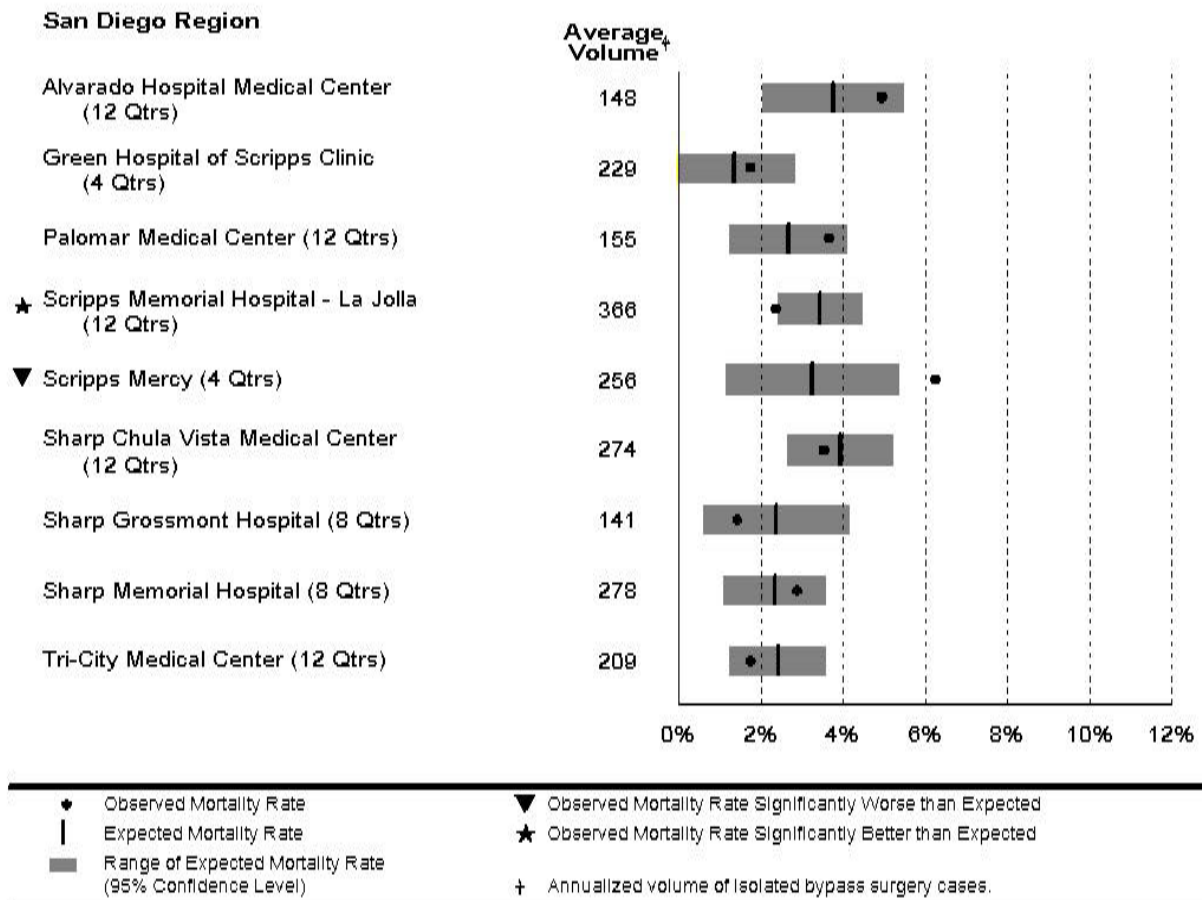
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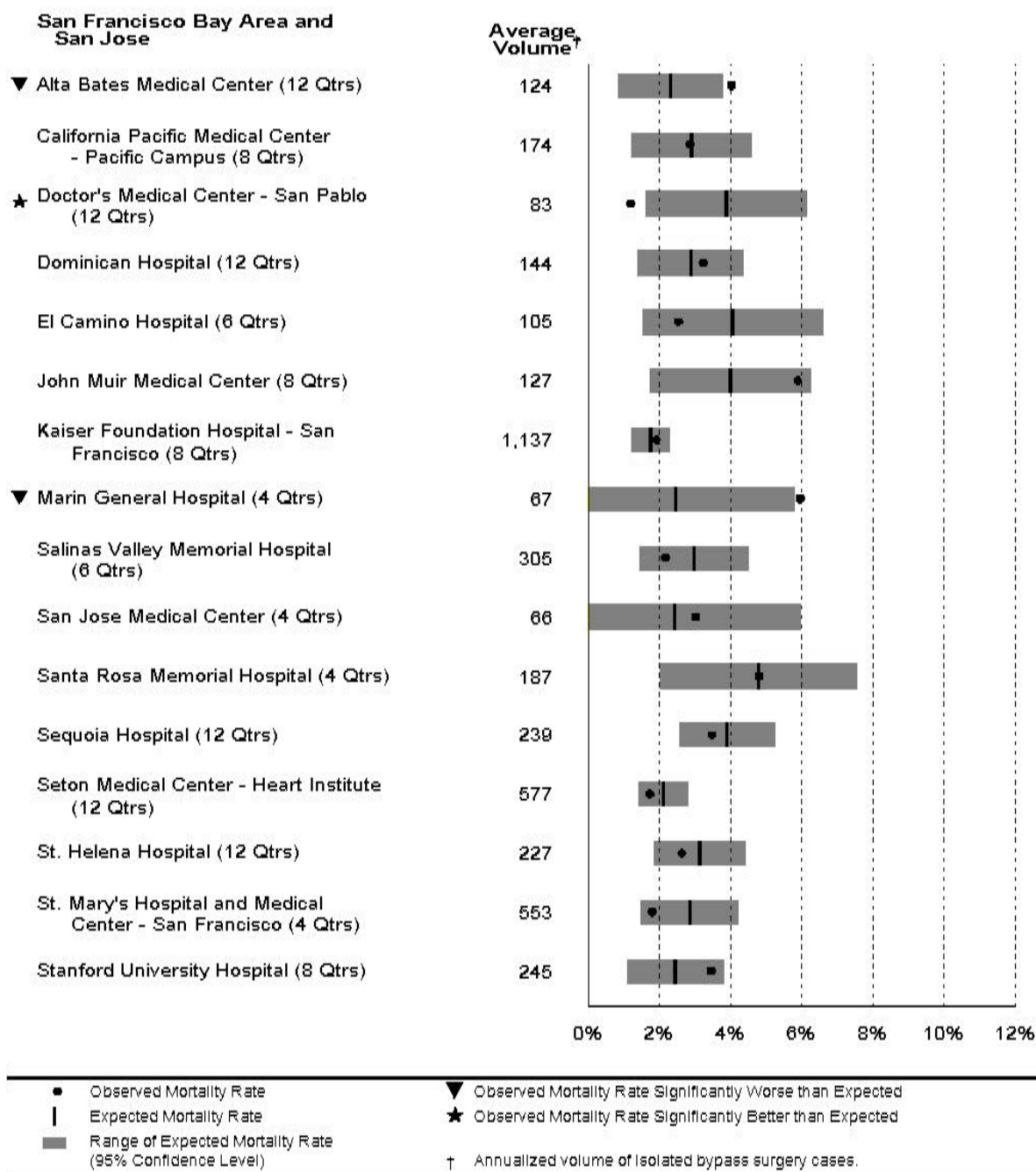
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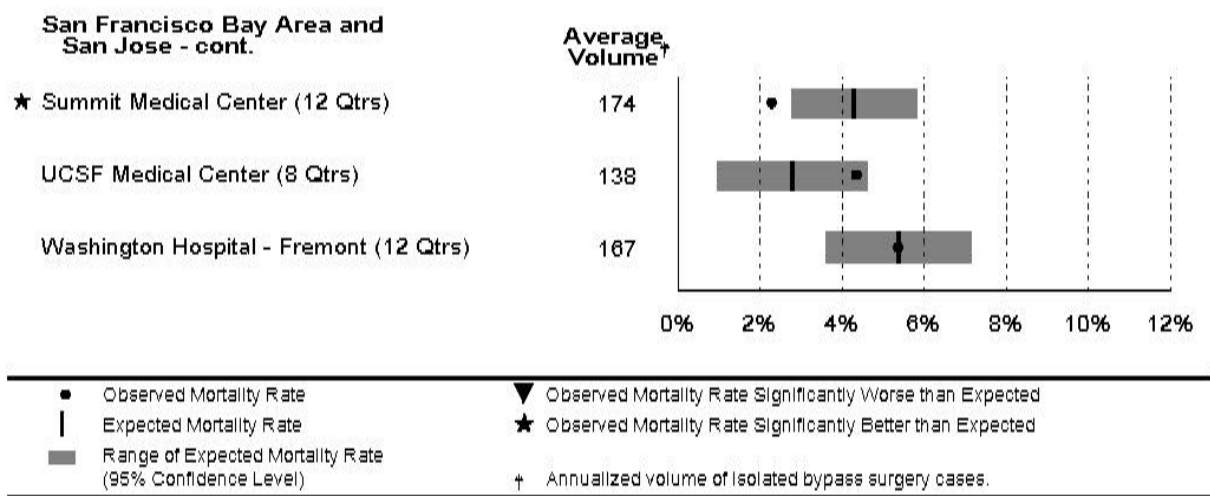
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